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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/629,744

07/30/2003

Rajesh Bordawekar

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06/01/2006

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EXAMINER

LIN, SHEW FEN

ART UNIT

PAPER NUMBER

2166

DATE MAILED: 06/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/629,744	<b>Applicant(s)</b> BORDAWEKAR ET AL.	
	<b>Examiner</b> Shew-Fen Lin	<b>Art Unit</b> 2166	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 30 July 2003.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 8-13,29 and 30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 14-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>7/30/2003</u> . | 6) <input type="checkbox"/> Other: _____  |

**Detail Action**

- a. This action is responsive to communications: application filed on 7/30/2003.
- b. Claims 1-7 and 14-28 are pending in this Office Action. Claims 8-13 and 29-30 are withdrawn from further consideration. Claims 1, 14, and 15 are independent claims.

***Election/Restrictions***

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-7 and 14-28, drawn to a method to build an auxiliary ordered tree, classified in class 707, subclass 100.
- II. Claims 8-13 and 29-30, drawn to a method to update (insert/delete) data to a hierarchical document, classified in class 707, subclass 203.

Applicant elected the invention of Group I with traverse on 3/15/2006 with the reason that the Examiner's search with regard to both the Group I and Group II claims would be coextensive, and there would be no additional searching burden. The Examiner respectfully disagrees.

Group I and II belong to different classes and the claimed subject matter cannot be adequately searched by class or keyword. Furthermore, in 37 CFR 1.141, the statement is made that two or more "independent and distinct inventions" may not be claimed in one application. Therefore, restriction for examination is proper.

***Claim Rejections - 35 USC § 101***

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1 and 14-15 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 1 and 14-15 are not statutory because there is no physical transformation being claimed nor a practical application is established to produce a concrete, useful, and tangible result.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 1 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The specification does not provide enough information to enable person skilled in the art being able to correspond the first/second parameter to the maximum/minimum number of children in each node. Therefore, first and second parameters would be examined based on the best understanding by the Examiner.

Claim 14 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The specification does not provide enough information to enable person skilled in the art being able to “optimizing an auxiliary ordered tree” based on “adjusting the maximum..” and “the selected minimum...”. First, it is unclear that “optimizing” means to optimize tree size/level or update/total cost. Second, selecting maximum/minimum number of children based on the application requirements of the size of the labels is not disclosed in the specification.

Claim 15 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The specification does not provide enough information to enable person skilled in the art being able to encode auxiliary ordered tree based on the maximum/minimum number of children for each node and using a virtual tree to minimize space requirements. First, it is unclear what “minimizing space requirements” refers to. Second, Applicant does not disclose how to “minimizing space requirements using a virtual tree”.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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Claim 7 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 recites the limitation "the updated auxiliary ordered tree" in line 3. There is insufficient antecedent basis for this limitation in the claim.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 3-5, 16, 18-19, 22, and 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Neil et al. (US Patent, 6,889,226, hereinafter referred as O'Neil) in view of Gulutzan et al. (Peter Gulutzan, Trudy Pelzer, "SQL Performance Tuning", Addison Wesley Professional, September 10, 2002, hereinafter referred as Gulutzan).

**As to claims 1, 16, and 22**, O'Neil discloses a system with methods /means / system maintaining the order of nodes in a hierarchical document (abstract, lines 3-7, Figures 2-3), comprising:

selecting a first parameter corresponding to a selected maximum number of children for each node for an auxiliary ordered tree (limit by bit length, column 9, lines 50-58);

selecting a second parameter corresponding to a selected minimum number of children for each node for an auxiliary ordered tree;

building the auxiliary ordered tree (Figure 5) having at least as many leaves as atoms within said hierarchical document (Figure 3, column 1, lines 39-41) based upon the first and second parameters;

attaching the atoms to the leaves of said auxiliary ordered tree (Figure 3, column 6, lines 66-67); and

labeling each of the nodes in the auxiliary ordered tree (column 1, lines 48-54, column 6, lines 48-51).

O'Neil discloses the elements of claims 1 as noted above but does not explicitly disclose "selecting a second parameter corresponding to a selected minimum number of children for each node for an auxiliary ordered tree".

Gulutzan discloses B+trees are the default structure built for indexing and searching (page 1). A B+tree of order  $m$  is a tree with the characteristics: every node has at most  $m$  children (maximum number of child, page 2); every node except for the leaves, has at least  $(m/2)$  children (minimum number of child, page 2); all leaves appear on the same level; and all keys are in the leaf nodes (page 2).

It would have been obvious to a person of ordinary skill in the art at the time of invention was made to modify O'Neil's disclosure to build labeled tree directly on B+Tree as taught by Gulutzan for the purpose of fast updating (insert/delete) (sortable, selective, subset, and balanced, page 3, Gulutzan). The skilled artisan would have been motivated to improve the invention of O'Neil per the above such that no specialized data structures that are not well supported by DBMSs is needed.

**As to claims 3 and 24**, O'Neil discloses further comprising assigning labels to the atoms in the hierarchical document based upon the labels assigned to the corresponding leaves in the auxiliary ordered tree (assign label to nodes, Figure 4, column 8, lines 7-15).

**As to claims 4, 18, and 25**, O'Neil discloses further comprising storing the labels of the leaves of the auxiliary ordered tree (store in plurality of rows, Figure 4, column 8, lines 7-9).

**As to claims 5, 19, and 26**, O'Neil discloses further comprising storing the remaining portion of the auxiliary ordered tree (store in plurality of rows, Figure 4, column 8, lines 7-9).



Claims 2, 7, 17, 21, 23, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Neil in view of Gulutzan and further in view of Dietz ("Maintaining order in a linked list", ACM, 1982, page 122-127).

As to claims 2, 17, and 23, O'Neil and Gulutzan (referred as O'Neil-Gulutzan) disclose the elements of claims 1 as noted above but does not explicitly disclose, "labeling nodes based on height of the node and the maximum number of children per node", wherein the labeling of the nodes in the auxiliary tree is defined by:

$N(\text{root})=0;$

$N(x)=N(y)+I \cdot (f-1)^{h(x)};$  and  $0 \leq I < f$

Where:

$N(x)$  is the label for node  $x$ ;

$x$  is the  $i^{\text{th}}$  child of  $y$ ;

$f$  is the maximum number of children per node; and

$h(x)$  is the height of node  $x$ .

Dietz discloses using an indexed 2-3 tree to maintaining order in a linked list (abstract, page 122). The indexed 2-3 trees satisfy the following properties: all leaves occur at the same depth in the tree; all nonleaves have 2 or 3 children; the root has index 0;  $x$  has index  $p(y) + (i-1) 3^{h(x)}$  (page 123, right column, paragraph 1-2).

It would have been obvious to a person of ordinary skill in the art at the time of invention was made to modify O'Neil-Gulutzan's disclosure to label B+Tree using  $N(x)=N(y)+I \cdot (f-1)^{h(x)};$  and  $0 \leq I < f$  (replace the maximum number[3] of a 2-3 indexed tree with the maximum number  $[f-1]$  of B-Tree) as taught by Dietz for the purpose of renumbering the whole list only every  $f$  insertions (page 123, left column, paragraph 6, Dietz). The skilled artisan would have

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been motivated to improve the invention of O'Neil-Gulutzan per the above such that the order of the tree is maintained while minimizing renumbering (page 122, right column, paragraph 3, Dietz).

As to **claims 7, 21, and 28**, Dietz discloses further comprising re-assigning labels to the atoms in the hierarchical document based upon the labels assigned to the corresponding leaves in the updated auxiliary ordered tree (renumbering all descendants nodes when inserting new node causing split due to exceed maximum allowable number, page 123, right column, paragraph 2).

Claims 6, 20, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Neil in view of Gulutzan and further in view of Abiteboul et al. ("Compact labeling schemes for ancestor queries", In Proceedings of 12th ACM-SIAM Symposium on Discrete Algorithms (2001) 547--556, hereinafter referred as Abiteboul).

As to **claims 6, 20, and 27**, O'Neil discloses using descendant limit on subtrees to speed up the search but does not explicitly disclose partitioning tree into leaves and the rest of the portion.

Abiteboul discloses partitioning tree into a first portion that comprises the leaves (page 548, paragraph 2, lines 6-9) from the tree and a second portion that comprises the remaining portion of the tree (parentesized label, page 548, paragraph 2, lines 6-9).

It would have been obvious to a person of ordinary skill in the art at the time of invention was made to modify O'Neil-Gulutzan's disclosure to partition tree into a two level partition as

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taught by Abiteboul for the purpose of reduce the maximum label size (page 548, left column, paragraph 2, lines 9-14). The skilled artisan would have been motivated to improve the invention of O'Neil-Gulutzan per the above such that the size of label is compacted and can be maintained in the memory to enhance search (page 547, abstract, paragraph 2, Abiteboul).

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et. al ("ViST: A Dynamic Index Method for Querying XML Data by Tree Structure", ACM SIGMOD, June, 2003, hereinafter referred as Wang) in view of Rastogi et al. (US Patent, 6,247,016, hereinafter referred as Rastogi).

As to claim 14, Wang discloses a method of optimizing an auxiliary ordered tree having at least as many leaves as atoms within a hierarchical document (abstract, lines 10-13), the shape of the auxiliary ordered tree being based upon a selected maximum number of children for each node and a selected minimum number of children for each node (B+tree has maximum/minimum number of children depending on order, abstract, lines 16-18, Figure 6), the method comprising adjusting the maximum number of children for each node and the selected minimum number of children for each node of the auxiliary ordered tree based upon application requirements regarding one of update cost, total cost of queries and updates, and the size of the labels.

Wang does not explicitly disclose optimizing one of update cost, total cost of queries and updates, and the size of the labels.

Rastogi discloses optimizing cost by minimizing split cost (column 5, lines 25-36, column 8, lines 46-50).

It would have been obvious to a person of ordinary skill in the art at the time of invention was made to modify Wang's disclosure to adjust split and associated subtree as taught by Rastogi for the purpose of minimizing the size and cost of subtree (column 8, lines 22-27, Rastogi). The skilled artisan would have been motivated to improve the invention of Wang per the above such that the cost is optimized.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang in view of Abiteboul.

As to claim 15, Wang discloses a method of encoding an auxiliary ordered tree having at least as many leaves as atoms within a hierarchical document (abstract, lines 10-13), the shape of the auxiliary ordered tree being based upon a selected maximum number of children for each node and a selected minimum number of children for each node (B+tree has maximum/minimum number of children depending on order, abstract, lines 16-18, Figure 6), the method comprising minimizing space requirements using a virtual tree.

Wang discloses a virtual suffix tree to organize structure to speed up the matching process (page 2, paragraph 3, lines 6-8) but does not explicitly disclose minimizing space requirements using a virtual tree.

Abiteboul discloses creating virtual tree by partitioning tree into a first portion that comprises the leaves (page 548, paragraph 2, lines 6-9) from the tree and a second portion that comprises the remaining portion of the tree (parenthesized label, page 548, paragraph 2, lines 6-9).

It would have been obvious to a person of ordinary skill in the art at the time of invention was made to modify Wang's disclosure to partition tree into a two level partition as taught by

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Abiteboul for the purpose of reduce the maximum label size (page 548, left column, paragraph 2, lines 9-14, Abiteboul). The skilled artisan would have been motivated to improve the invention of Wang per the above such that the space requirement is minimized.

### ***Related Prior Arts***

The following list of prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Kashima, Hisashi et al., US 20030172352 A1, "Classification method of labeled ordered trees using support vector machines"
- Bergman; Lawrence David et al., US 6408300 B1, "Multidimensional indexing structure for use with linear optimization queries"
- Bumbulis; Peter, US 6694323 B2, "System and methodology for providing compact B-Tree"
- Shadmon; Moshe et al., US 6804677 B2, "Encoding semi-structured data for efficient search and browsing"

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shew-Fen Lin whose telephone number is 571-272-2672. The examiner can normally be reached on 8:30AM - 5:00PM.

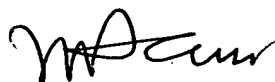
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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hosain Alam can be reached on 571-272-3978. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Shew-Fen Lin  
Patent Examiner

Art Unit 2166  
May 26, 2006



**HOSAIN ALAM**  
**SUPERVISORY PATENT EXAMINER**